The State of the Art of Neurodynamic Optimization:

Past, Present, and Prospect

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Abstract – As an important tool for science research and engineering applications, optimization is omnipresent in a wide variety of settings. It is computationally challenging when optimization procedures have to be performed in real time to optimize the performance of dynamical systems. For such applications, classical optimization techniques may not be competent due to the problem dimensionality and stringent requirement on computational time. New paradigms are needed. One very promising approach to dynamic optimization is to apply artificial neural networks. Because of the inherent nature of parallel and distributed information processing in neural networks, the convergence rate of the solution process is not decreasing as the size of the problem increases. This talk will present the state of the art of neurodynamic optimization models and selected applications. Specifically, starting from the motivation of neurodynamic optimization, we will review various recurrent neural network models for optimization. Theoretical results about the stability and optimality of the neurodynamic optimization models will be given along with illustrative examples and simulation results. It will be shown that many computational problems can be readily solved by using the neurodynamic optimization approaches.

Jun Wang is the Chair Professor Computational Intelligence in the Department of Computer Science at City University of Hong Kong. Prior to this position, he held various academic positions at Dalian University of Technology, Case Western Reserve University, University of North Dakota, and the Chinese University of Hong Kong. He also held various short-term visiting positions at USAF Armstrong Laboratory, RIKEN Brain Science Institute, Dalian University of Technology, Huazhong University of Science and Technology, and Shanghai Jiao Tong University (Changjiang Chair Professor). He received a B.S. degree in electrical engineering and an M.S. degree in systems engineering from Dalian University of Technology and his Ph.D. degree in systems engineering from Case Western Reserve University. His current research interests include neural networks and their applications. He published about 200 journal papers, 15 book chapters, 11 edited books, and numerous conference papers in these areas. He is the Editor-in-Chief of the *IEEE Transactions on Cybernetics*. He also served as an Associate Editor of the *IEEE Transactions on Neural Networks* (1999-2009), *IEEE Transactions on Cybernetics* and its predecessor (2003-2013), and *IEEE Transactions on Systems, Man, and Cybernetics – Part C* (2002–2005), as a member of the editorial board of *Neural Networks* (2012-2014), editorial advisory board of *International Journal of Neural Systems* (2006-2013. He was an organizer of several international conferences such as the General Chair of the 13th

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